

REMARKS

Applicants appreciate the detailed examination evidenced by the Office Action mailed July 10, 2007 ("Office Action"). Applicants also appreciate the continued allowance of Claims 19 and 20 and the indication that Claims 2-5 include patentable subject matter. Office Action, page 5.

In response, Applicants maintain the patentability of the rejected claims over Teo and, respectively, request reconsideration of the rejected claims. Applicants respectfully submit that the pending claims are patentable for at least the reasons described herein.

Claim 1 is Patentable Over Teo

Claims 1, 6, 11-13, 16 and 17 are rejected under 35 U.S.C. §103(a) as being unpatentable over anticipated by (sic) Teo (US 5,970,374). Office Action, page 2. Applicants respectfully traverse the rejection based on Teo as Teo does not disclose or suggest, for example:

- forming an intaglio pattern in a mold layer;
- forming a barrier layer on an upper surface of the mold layer and in the intaglio pattern;
- forming a flowable material on the barrier layer;
- removing a portion of the flowable material and a portion of the barrier layer outside the intaglio pattern to expose an upper surface of an oxide layer included in the mold layer and avoiding removing a portion of the flowable material and a portion of the barrier layer inside the intaglio pattern;
- removing the portion of the flowable material from inside the intaglio pattern;
- forming a conductive layer** on the portion of the barrier layer inside the intaglio pattern and on the upper surface wherein the conductive layer comes in contact with the barrier layer and the upper surface, **wherein the conductive layer comprises aluminum and the aluminum in the conductive layer comes in contact with the upper surface**; and
- removing the conductive layer from the upper surface.

(*Emphasis added.*) Figures 3D-3E of Teo clearly show that a Ti/TiN barrier layer 30 is formed in the recess and on an upper surface of layer 14 prior to the formation of tungsten layer 40. As indicated by the above-highlighted recitations of independent Claim 1, Teo does not disclose or suggest forming a conductive layer that comprises aluminum and comes in

contact with the upper surface of the mold layer. To the contrary, Figures 3D-3E of Teo show that the tungsten layer 40 is formed to be in contact with the Ti/TiN barrier layer 30 both inside and outside the recess. Accordingly, the tungsten layer 40 in Teo does not come in contact with an upper surface (of an oxide layer) as the Ti/TiN barrier layer 30 separates the tungsten layer 40 from the insulating layer 14.

The Office Action acknowledges that the aluminum conductive layer does not come into contact with the upper surface in the method taught by Teo and states that:

It would have been obvious to one of ordinary skill in the art at the time of the invention to have eliminated the Ti layer in the method taught by Teo because elimination of a step of an element and its function is obvious if the function of the element is not desired (MPEP 2144.04(II.a)). Teo discloses that when the opening is filled with aluminum or aluminum alloy, a Ti glue layer is deposited (col. 8, lines 1-7). ***In the case in which the glue layer function is not desired, eliminating the glue layer is obvious.***

(*Emphasis added.*) Office Action, page 4. As an initial matter, Applicants respectfully submit that the Office Action incorrectly characterizes the method steps recited in Claim 1 as eliminating a step disclosed by Teo. As a practical matter, the glue layer function described by Teo is applied to re-enforce the lower corners of the opening to reduce the risk of adhesion or barrier failure. (*See, e.g.,* Teo, column 6, lines 31-35). Applicants respectfully submit that the glue layer in Teo is inapplicable to the recitations of Claim 1 for at least the reason that Claim 1 is not directed to "improving step coverage of material deposited by a PVD technique in vertical walled openings in an insulative layer," as described and claimed in Teo. (Column 8, lines 23-26). Specifically, a glue layer as recited in Teo, appears to perform a specific function that is unrelated to the recitations of Claim 1. Thus, the absence of the glue layer is merely additional evidence as to the distinctions between Teo and the recitations of Claim 1.

Alternatively, even if the recitations of Claim 1 eliminate the glue layer as asserted by the Office Action, it is well established law that "[d]ispensing of an element, along with its function, leads to an arrangement which is not suggested by a reference." *Ex parte Bellsnyder, Sr., and Ritchie*, 73 U.S.P.Q. 269 (PO Bd. App. 1947). Thus, since the re-enforcing function of the glue layer appears to be dispensed with, the recited arrangement of

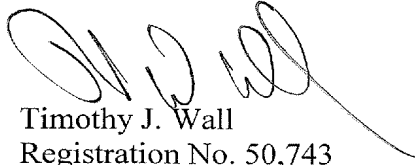
Claim 1 is not suggested by Teo. Additionally, "[w]hen omitting steps would run counter to the teaching of the reference patent relied upon, the patentability of a process with fewer steps is not precluded by 35 U.S.C. §103." *Ex parte Kaiser*, 189 U.S.P.Q. 816 (PTO Bd. App. 1974). Since Teo appears to use the glue layer in all described embodiments, omitting the step (element) would run counter to the teaching of Teo. Moreover, "[a] machine or article that is made with fewer parts or fewer components than the prior art, but which accomplishes all of the functions of the prior art, is the type of improvement which merits a patent." *Deering Milliken Research Corporation v. Beaunit Corporation*, 382 F.Supp. 403, 182 U.S.P.Q. 421, 425 (N.C. 1974). In this regard, Teo specifically states that "where aluminum or an aluminum alloy is to be used for filling vias...a glue layer is comprised solely of Ti and is deposited immediately prior to the MOCVD deposition of the aluminum or aluminum alloy." Teo, column 6, lines 45-51. Accordingly, independent Claim 1 is patentable over Teo for at least the reasons described above. Furthermore, dependent Claims 6-18 are also patentable over Teo for at least the reasons described above with reference to independent Claim 1.

In re: Jong-myeong Lee et al.
Serial No.: 10/813,330
Filed: March 30, 2004
Page 10 of 10

CONCLUSION

Applicants respectfully submit that pending claims are in condition for allowance, which is respectfully requested in due course. Favorable reconsideration of this application is respectfully requested. If any informal matters arise, the Examiner is encouraged to contact the undersigned by telephone at (919) 854-1400.

Respectfully submitted,

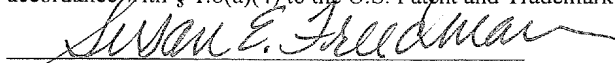


Timothy J. Wall
Registration No. 50,743
Attorney for Applicants

Correspondence Address:
Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401
Customer Number 20792

CERTIFICATION OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) to the U.S. Patent and Trademark Office on September 10, 2007.



Susan E. Freedman
Date of Signature: September 10, 2007